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Dilks

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[54] **REMOTE CONTROLLED WINCH**

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[73] Assignee: **Warn Industries, Inc.**, Milwaukie, Oreg.

[21] Appl. No.: **330,389**

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[51] **Int. Cl.**[6] **B66D 1/12**; B66D 1/22

[52] **U.S. Cl.** **254/323**; 242/587.2; 254/344; 254/362; 254/371; 254/DIG. 14

[58] **Field of Search** ..... 254/219, 323, 254/324, 325, 326, 327, 328, 344, 362, 371, DIG. 14; 242/587, 587.2, 613.1

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Primary Examiner—Joseph J. Hail, III

Attorney, Agent, or Firm—Klarquist, Sparkman, Campbell, Leigh & Whinston

[57] **ABSTRACT**

A remote controlled winch operable by a hand held remote control. The winch has a single piece drum that is reversibly driven by a drive motor through a planetary gear arrangement for winding cable onto the drum and unwinding cable off the drum. A remote control capable of handling the high amperage draw of the drive motor is provided to control power to and the rotative direction of the drive motor. The remote control has two switch arms that are connected to the motor leads with each of the switch arms normally biased to a ground connection. A manually operated mechanism is provided to selectively and independently switch (move) each of the switch arms from a ground connection to a connection with a power source to supply power to the motor and control the rotative direction of motor.

4 Claims, 4 Drawing Sheets

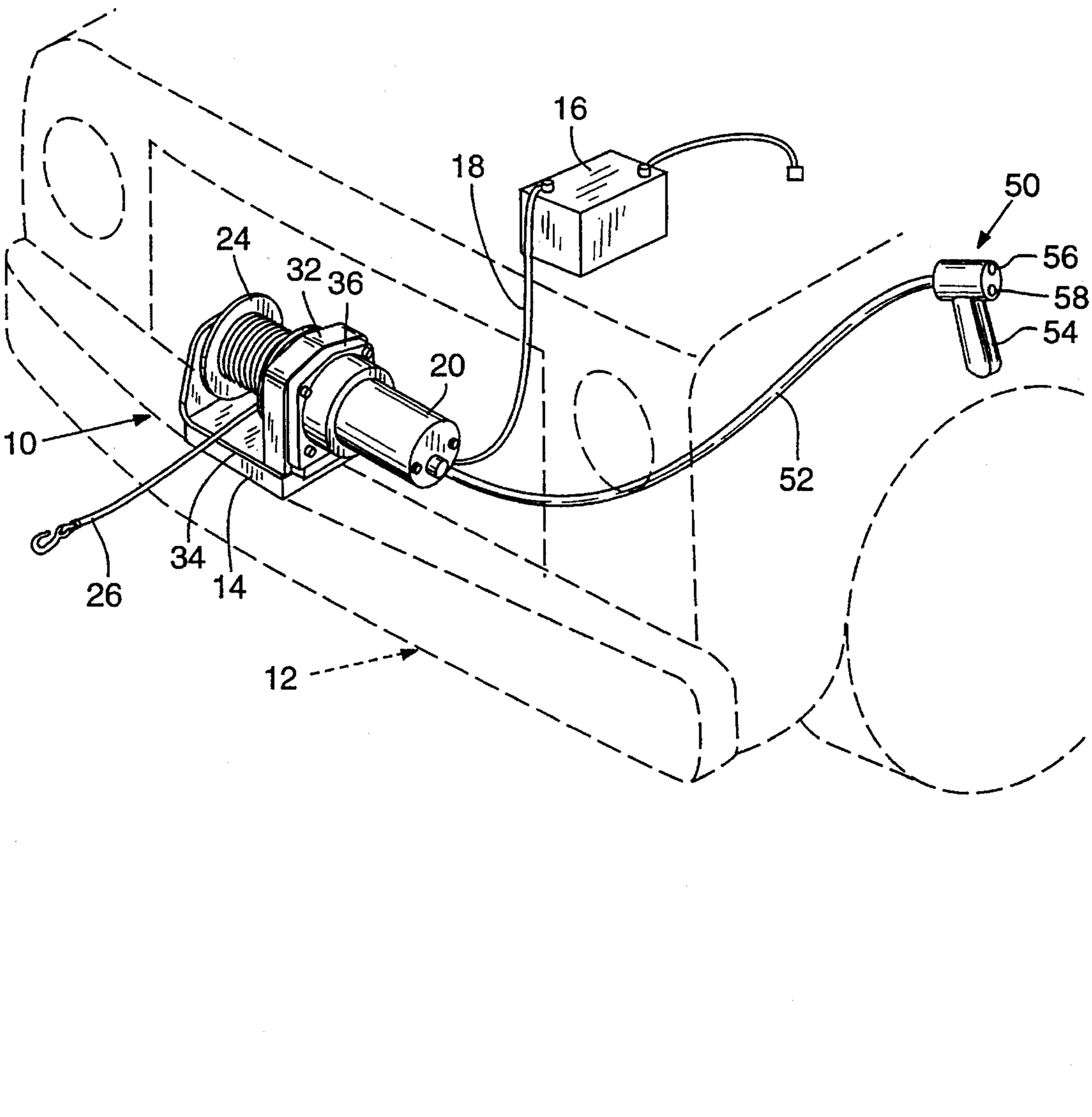

FIG. 1

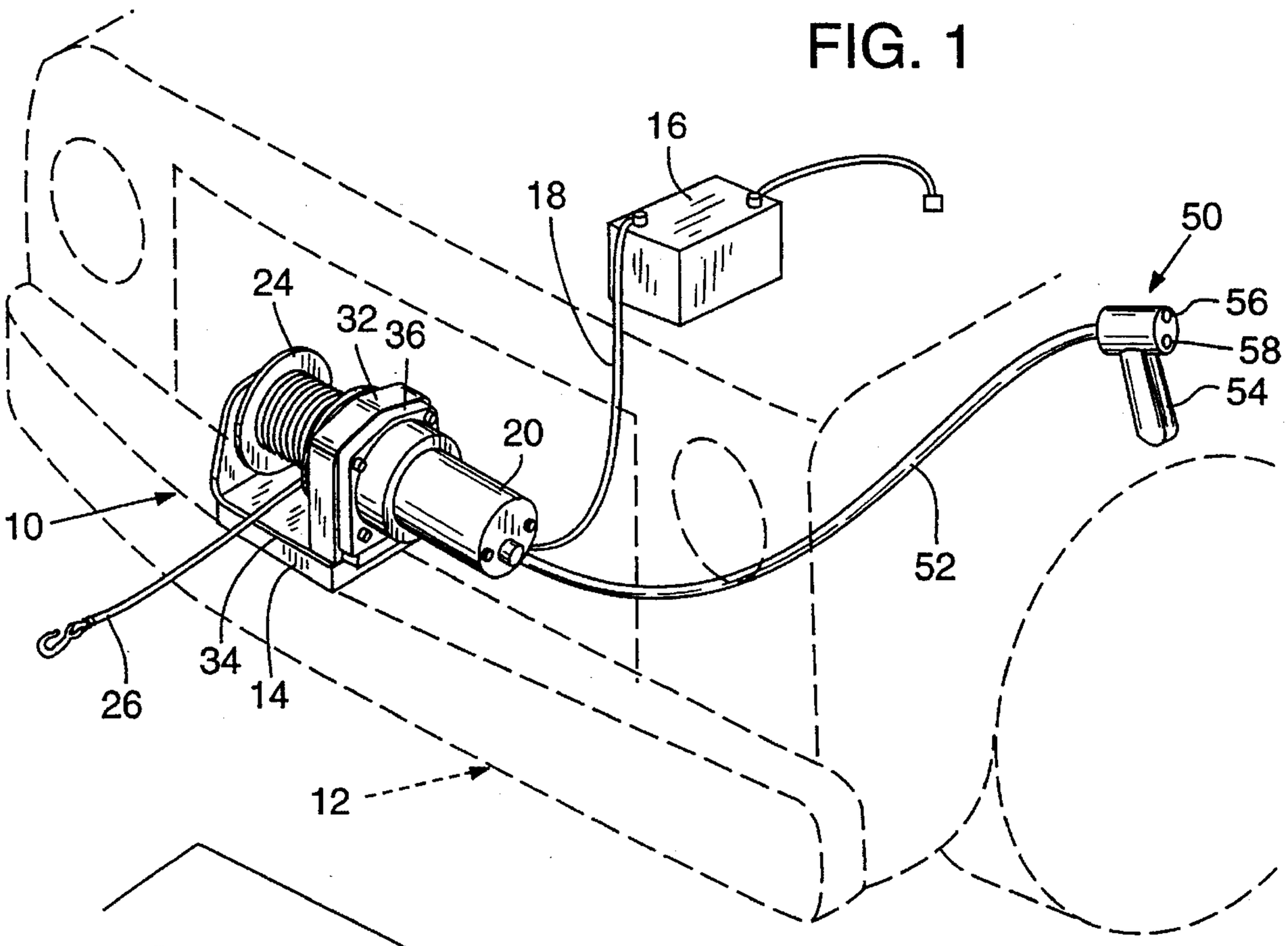
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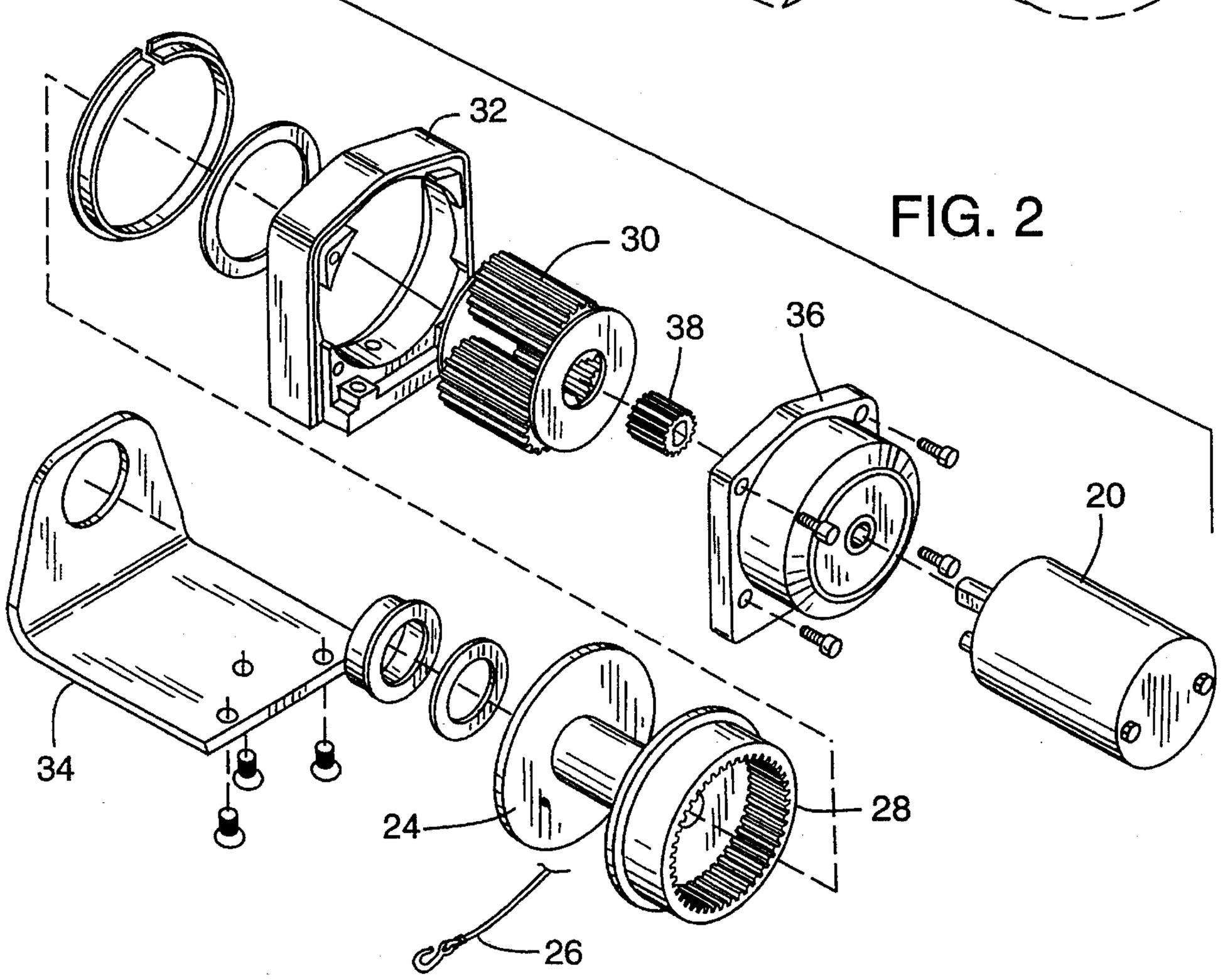
FIG. 2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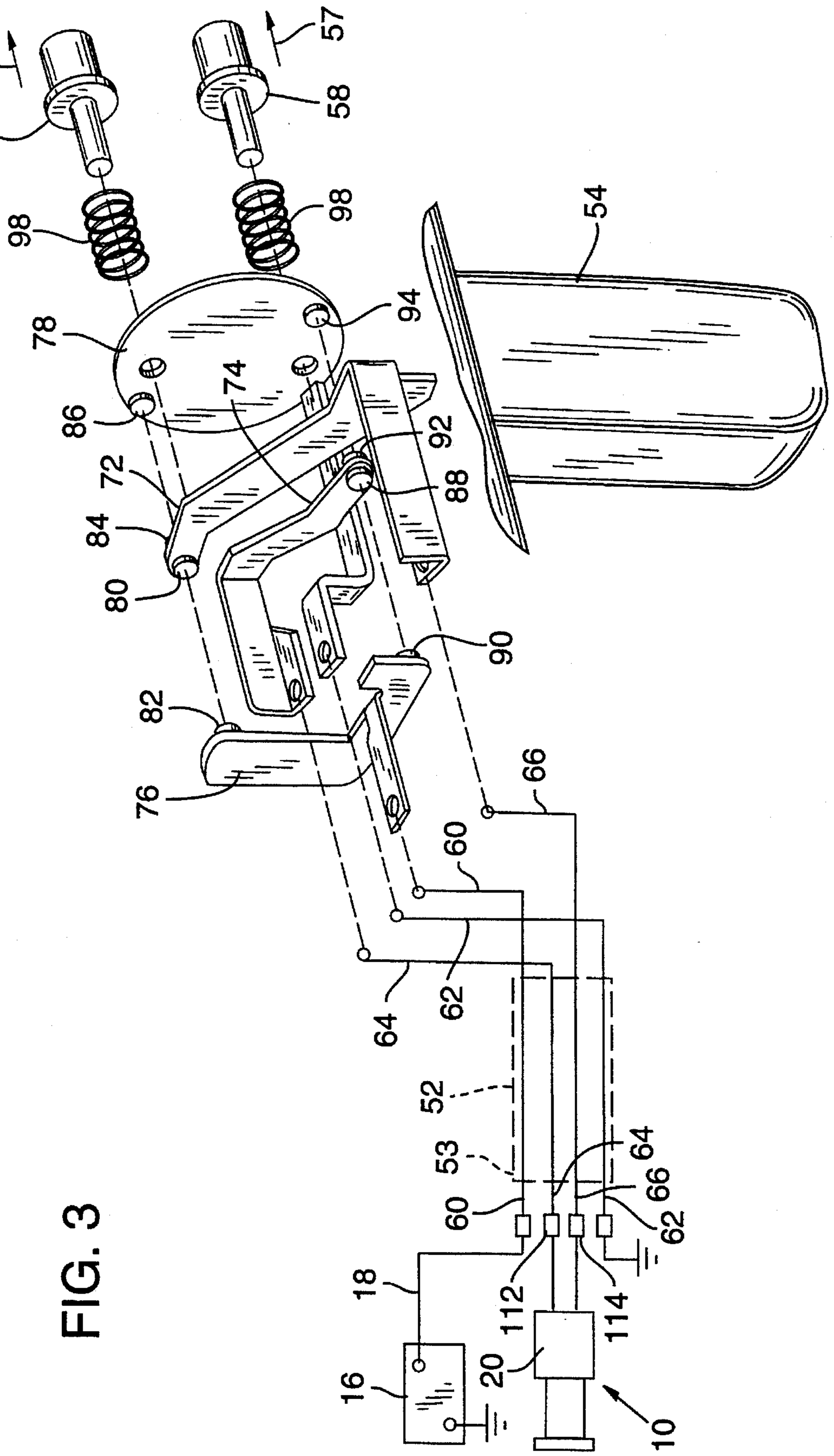
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FIG. 3

FIG. 4A

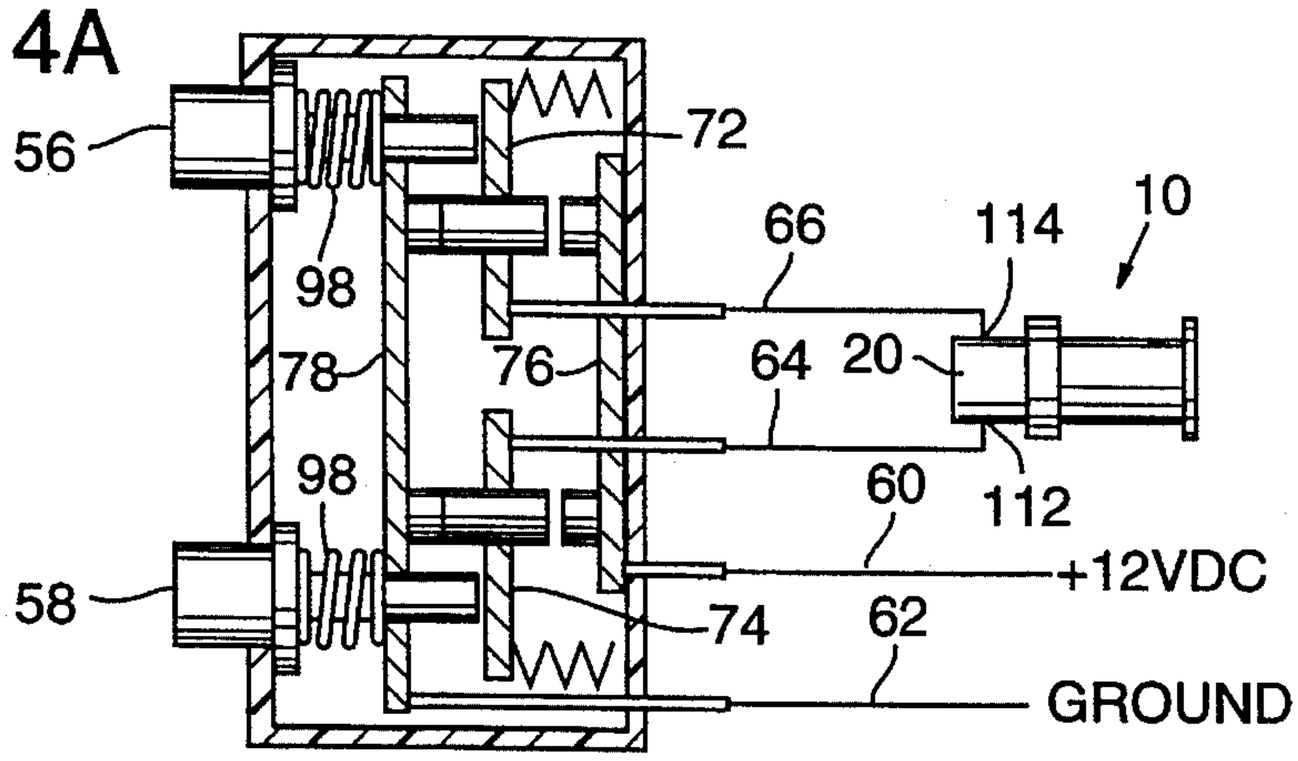


FIG. 4B

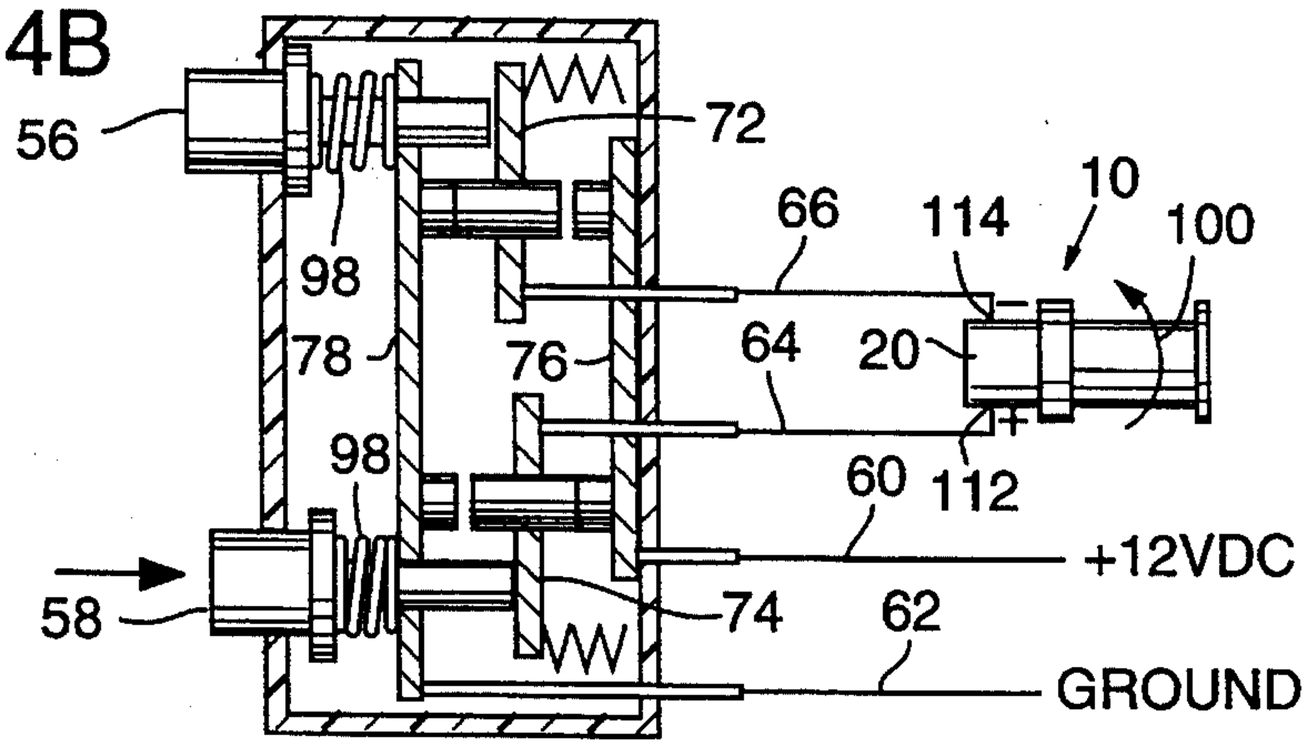


FIG. 4C

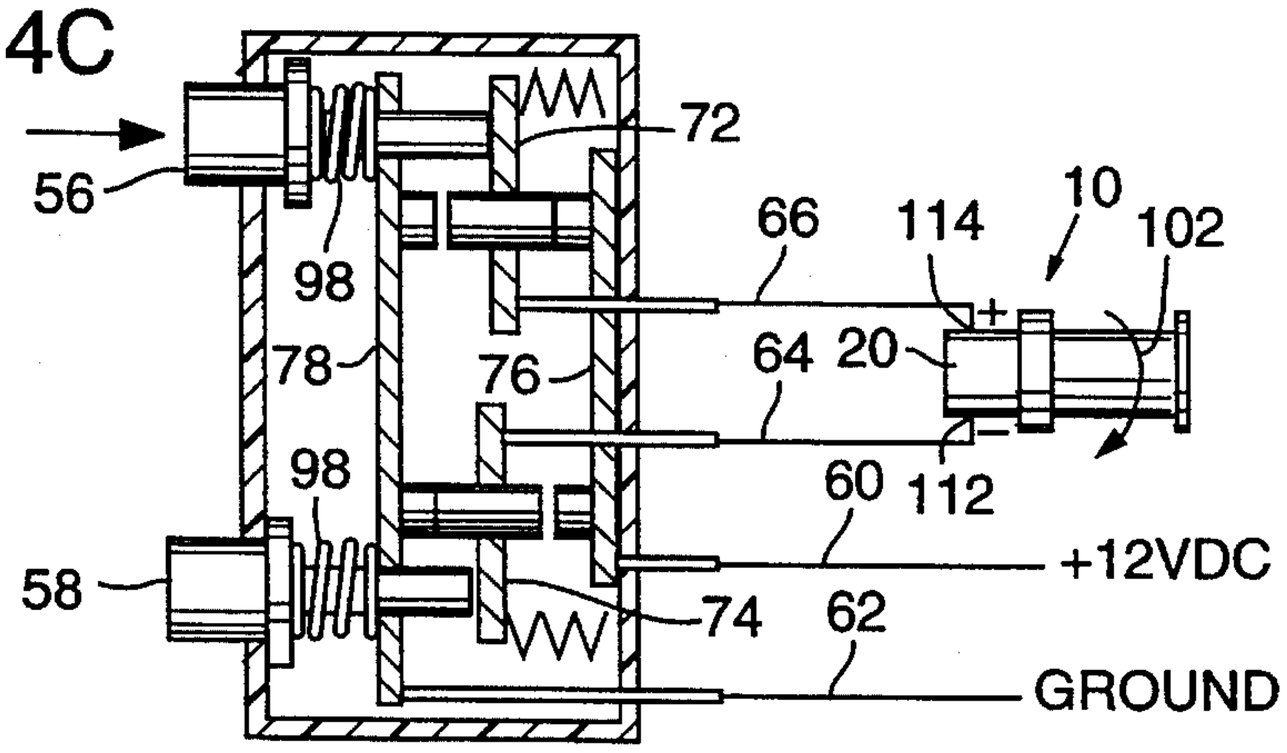


FIG. 5

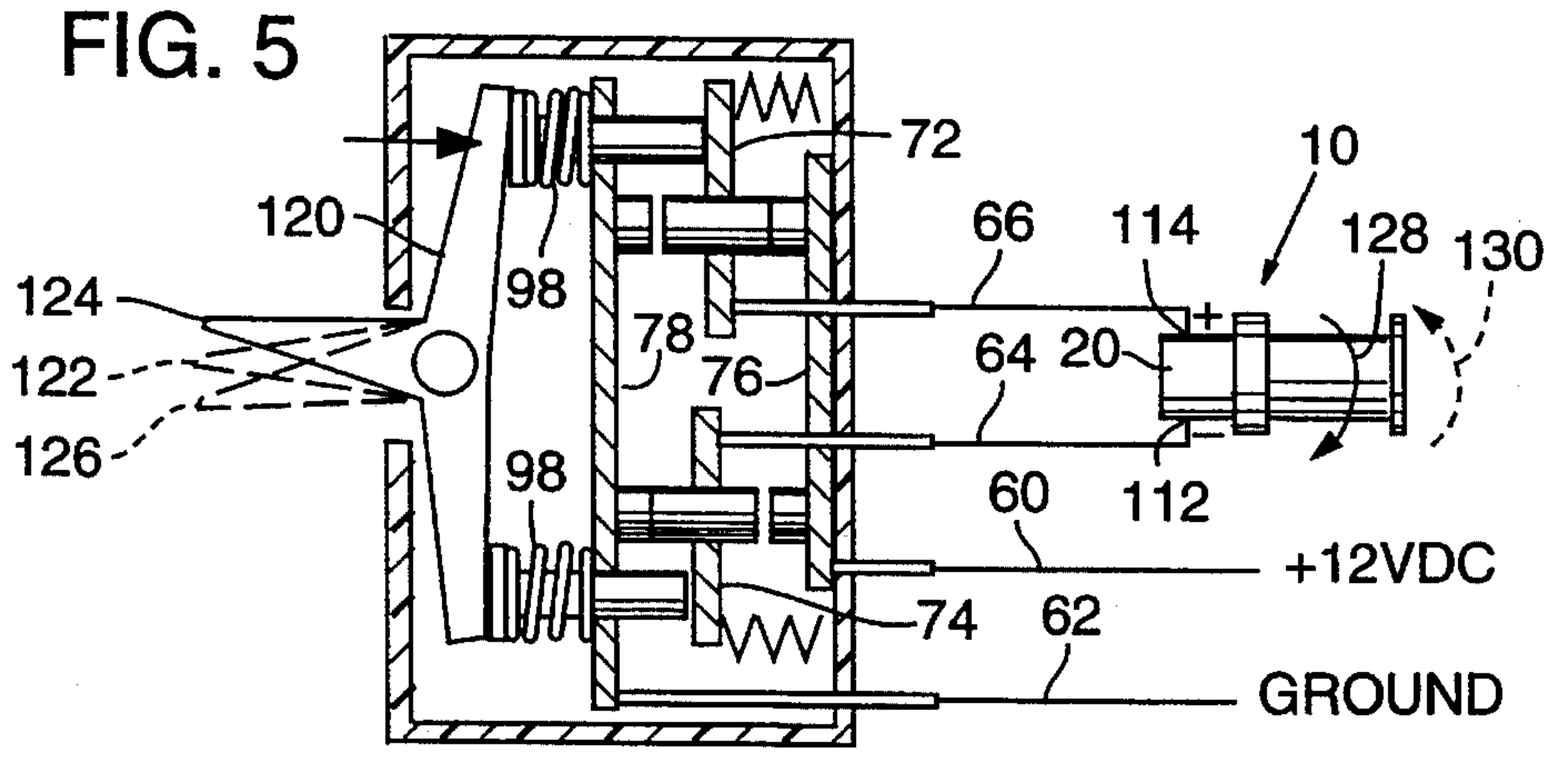


FIG. 6

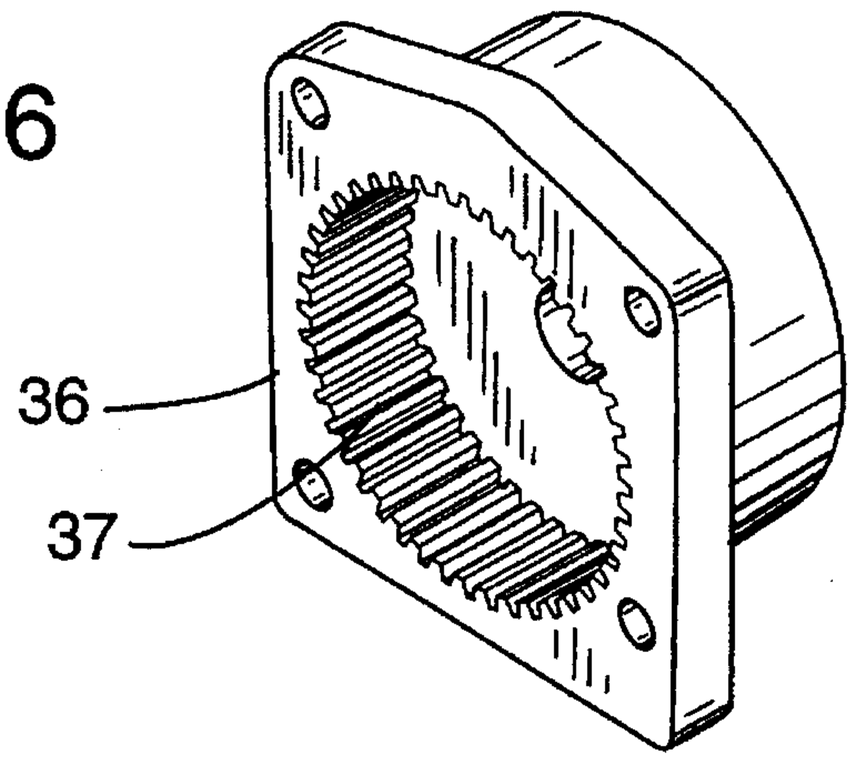


FIG. 7

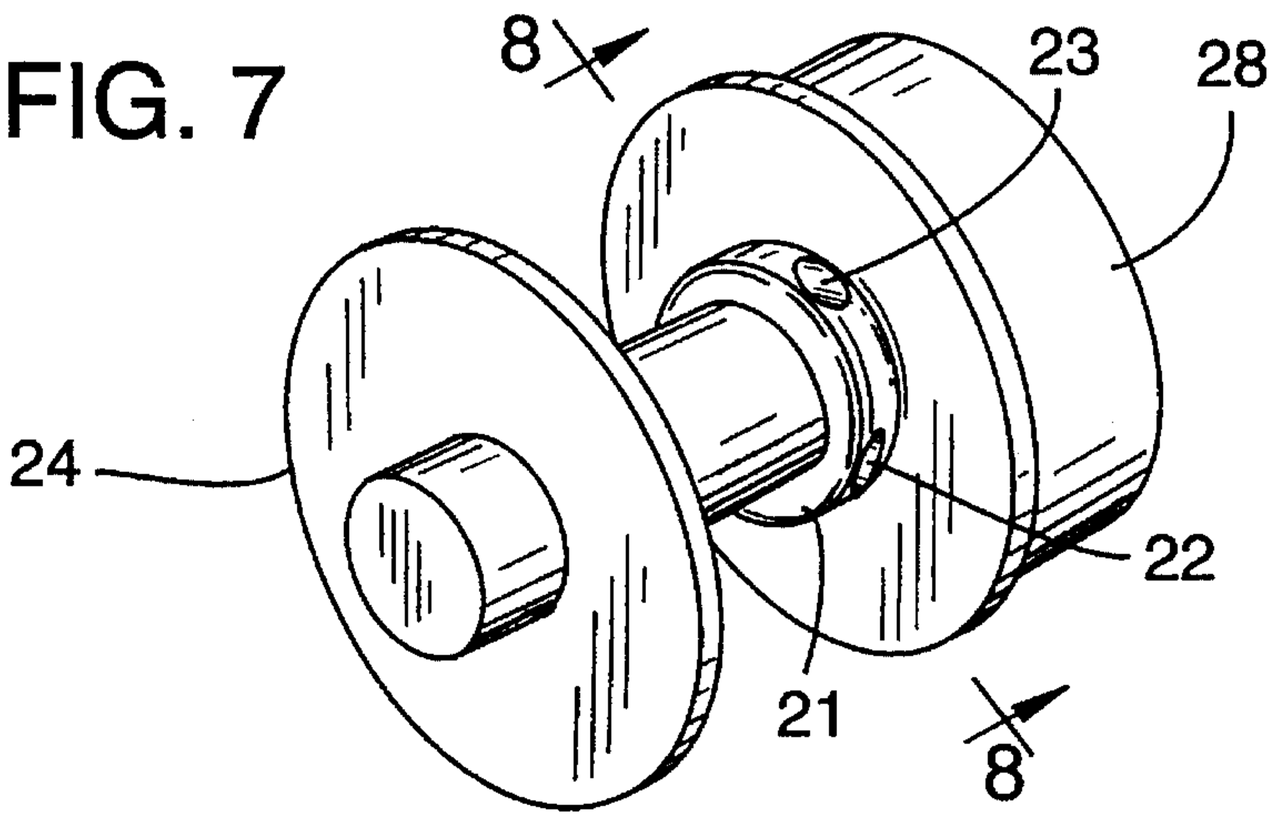
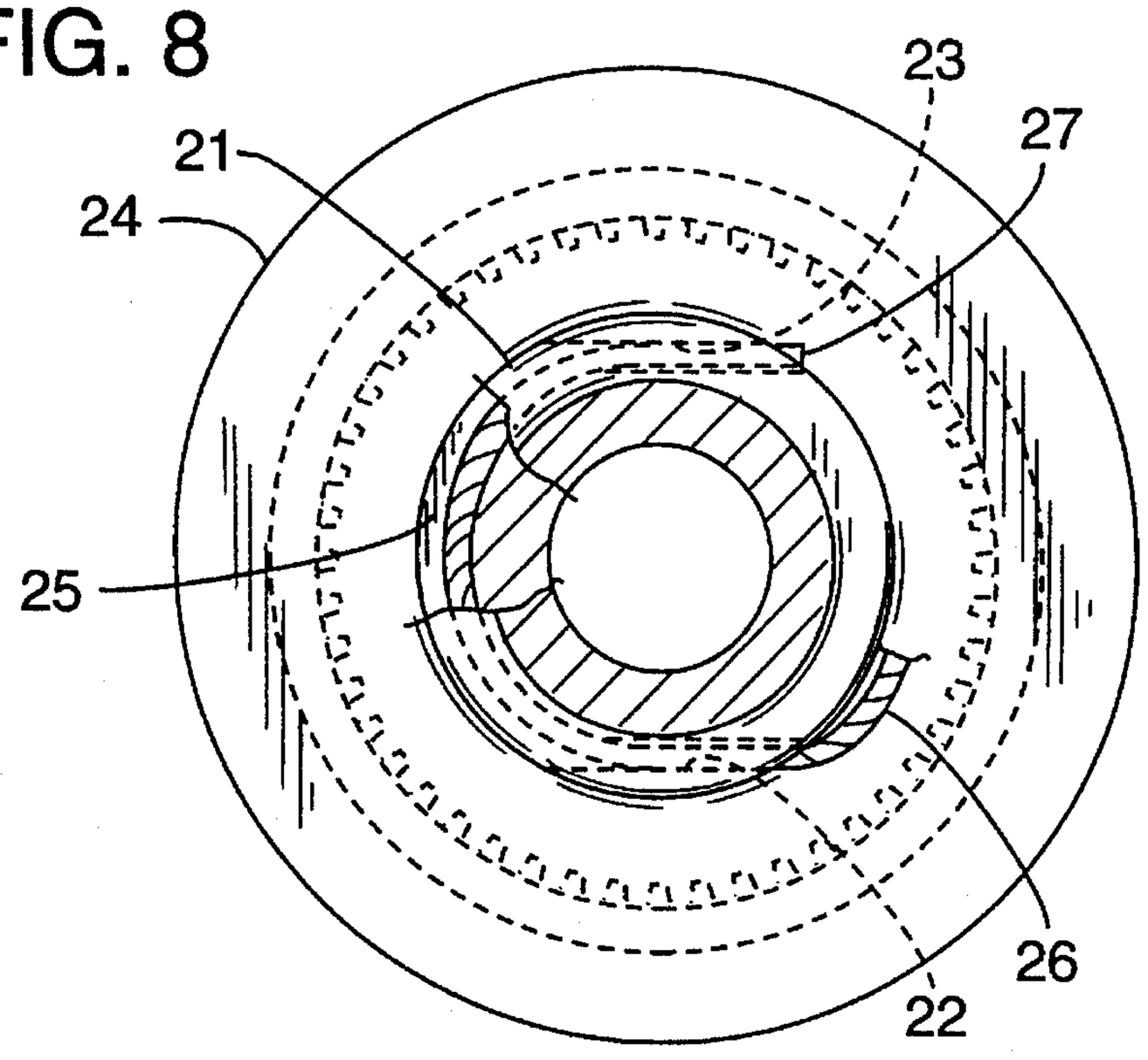


FIG. 8



REMOTE CONTROLLED WINCH

FIELD OF THE INVENTION

This invention relates to a winch having a rotatable drum for winding and unwinding a winch cable and more particularly to the manner of controlling the winding and unwinding operation by remote control.

BACKGROUND OF THE INVENTION

Winches are typically mounted to a vehicle and powered by the vehicle's battery, i.e., with DC current. A winch may be used, for example, to pull the vehicle out of a stuck condition. The winch cable is unwound from the drum, anchored, e.g., to a tree, and then wound back onto the winch to pull the vehicle toward the tree. Winding and unwinding of the winch is accomplished by reversing the rotation of the drum of the winch on which the cable is wound. This is achieved by switching the polarity of the DC current as applied to the winch motor.

A switch mounted to the winch motor will accomplish the three rotative conditions as between off, rotation, and counter rotation. However, it is often desirable to operate the winch motor as between the three conditions from a position remote from the winch. For example, the operator may not want to stand in front of the vehicle operating the winch as the winch is causing the vehicle to move forward.

Large winches used for heavy duty application are commonly equipped with the desired remote control. A control box mounted to the motor includes a solenoid which is electrically actuated to switch the winch motor between off, rotate, and counter rotate. The solenoid is actuated by a low voltage current applied through conductive wires leading to a handheld switch, i.e., a remote control.

Whereas the remote control described is very acceptable for large winches, there is a need for remote control on smaller winches as well. The category of winches here considered as a smaller winch is one which is designed, e.g., to apply 1,000 pounds of pulling force as compared to 5,000 pounds of pulling force for what is considered the large winches. The smaller winches are considerably less expensive and are thus available for many applications that cannot justify the expense of the larger winches. For example, an all terrain vehicle (ATV) used for recreation purposes will weigh in at several hundred pounds as compared to, e.g., a truck at well over three thousand pounds. The smaller winch mounted to the front end of the ATV will pull the ATV out of a stuck condition. The owner of the ATV may want to have a winch but not at the price of the large winches. This is but one example of many that make up a demand for the smaller winches as long as the cost is contained. It is therefore an objective of the small winch manufacturer to keep the manufacturing costs to a minimum. The solenoid pack (control box) itself is a major item cost wise and is not typically supplied on the smaller winches even though desirable as an accessory to the small winch owner.

BRIEF DESCRIPTION OF THE PRESENT INVENTION

It is accordingly an object of the present invention to provide a low cost remote control for a small winch. In the preferred embodiment the wire conductors that normally run from the vehicle battery to the solenoid pack at the winch motor (power and ground) instead run to a handpiece that serves as the remote control. A second set of wires runs from the handpiece back to the winch motor. The power and

ground conductors for the battery terminate at the hand piece in two spaced apart conductive plates, the ground plate overlying the power plate. The two winch motor conductors terminate in spring members that are located between the plates and are spring biased against the ground plate. First and second buttons on the handpiece are positioned to selectively deflect the two spring members respectively toward the underlying power plate. Thus, with the buttons not depressed, both winch motor conductors are in contact with the ground plate and not the power plate and the motor is without power and in the off condition. Manual depressing of one of the buttons causes one of the winch motor conductors to disconnect from ground and connect to power and the winch motor is driven in one rotative direction causing rotation of the winch drum. Release of that button and engagement of the other button reverses the motor and the rotation of the winch drum.

The remote control is simple in design and construction and adds little to the cost of the small winch. These and other advantages will be more clearly appreciated upon reference to the following detailed description having reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a view of a remote controlled winch of the present invention mounted on a vehicle;

FIG. **2** is an exploded view of the remote controlled winch of FIG. **1**;

FIG. **3** is an exploded view of a remote control of the winch of FIG. **1**;

FIGS. **4A–4C** are views illustrating the operation of the remote control of the winch of FIG. **1**;

FIG. **5** is a view illustrating an alternate embodiment of the remote control of the winch of FIG. **1**.

FIG. **6** is another view of the gear housing of the winch of the present invention;

FIG. **7** is another view of the cable drum of the winch of the present invention; and,

FIG. **8** is a view of the cable drum as viewed on view lines **8—8** of FIG. **7**.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Refer to FIG. **1** of the drawings which illustrates a remote controlled winch **10** of the present invention mounted on a vehicle **12**, such as an all terrain vehicle (ATV). The winch **10** includes an electric drive motor **20** and the motor **20** is powered by the vehicle battery **16**. A cable **18** is provided to supply power from the battery **16** to the winch **10**. The winch **10** is mounted on a suitable mounting bracket **14** provided on the vehicle **12**. The winch **10** is shown mounted on the front of the vehicle **12**, but it will be appreciated that the winch may also be mounted at other positions such as on the rear of the vehicle.

The winch **10** is further illustrated in the exploded view of FIG. **2**. The winch **10** has a drum **24** for receiving a length of wire rope (cable) **26**. The drum **24** is preferably of a one piece casting with a ring gear **28** formed in one end and has a unique fastening arrangement for securing an end of the wire rope to the drum. An end of the wire rope **26** is secured to the drum **24** without the use of auxiliary fasteners as illustrated in FIG. **8** in conjunction with FIG. **7**. A hub **21** of the drum **24** has through bores **22, 23** and a groove **25**. An end **27** of the wire rope **26** is inserted through the bore **22**

and is extended to fit into the bore **23** with the end **27** terminating at the end of the bore **23** as shown. The wire rope **26** is snubbed into the groove **25** between the bores **22** and **23**. The wire rope **26** is thus secured to the drum **24**. It is typically recommended that the wire rope **26** have at least five wraps around the drum for additional security.

The drum **24** has a ring gear **28** on one end that is arranged to receive in mesh a planetary gear set **30**. The ring gear end **28** of the drum **24** is rotatably supported in a support housing **32**. The other end of the drum **24** is rotatably supported in a support bracket **34**. The bracket **34** also serves as a mounting plate to mount the winch to a vehicle. A gear housing **36** which has an internal gear form **37** (see FIG. **6**) to mesh with the planetary gear set **30** is mounted to the support housing **32** and in combination with the ring gear end **28** of the drum **24** encloses and supports the planetary gear set **30**. The support housing **32**, the support bracket **34**, and the gear housing **36** in combination form the base structure of the winch **10**.

The planetary gear set **30** has three planet gears instead of the usual two. The planet gears of the gear set **30** are of extended length to provide a long face width on the gear form. This distributes the load across the face and also provides for quieter operation. Noise reduction is also accomplished by producing the gear housing **36** out of a material such as nylon.

The motor **20** is mounted to the gear housing **36** and has a drive pinion **38** coupled to its drive shaft (not shown) that drives the planetary gear set **30**. The planetary gear set **30** as it is driven by the pinion **38** and being in mesh with the internal gear form **37** of the gear housing **36** and the ring gear **28** will cause the drum **24** to rotate. The number of gear teeth on the internal gear **37** of the gear housing **36** and the number of gear teeth on the ring gear **28** are unequal in number. In this embodiment the number of gear teeth on the internal gear **37** is fifty eight and the number of gear teeth on the ring gear **28** is fifty five.

The motor **20** is reversible so that the drum **24** may be driven in one direction to wind cable **26** onto the drum and driven in the opposite direction to unwind cable **26** off the drum **24**.

The motor **20** of the winch **10** is operable by a remote control **50** (see FIG. **1**). The remote control **50** in this embodiment has a suitable length of cable **52** and has a handle **54** (hand piece) that houses switch gear to control the operation of motor **20** with the handle **54** being suited for manipulation by one hand of an individual. The handle **54** includes a manually operated mechanism to operate the switch gear and in this embodiment, push buttons **56** and **58** are utilized to operate the switch gear within the handle **54** to provide power to the motor **20** and control the rotational direction of the motor depending on which push button **56**, **58** is depressed (pushed). Depressing push button **56** will provide power to the motor **20** for rotation of the motor **20** in one rotative direction and depressing push button **58** will provide power to the motor **20** for rotation of the motor **20** in the opposite direction. The remote control **50** permits operation of the winch at a location remote from the winch itself. It will be appreciated that the remote control **50** may be permanently mounted at a location in the vehicle **12** such as in the operator's compartment and may be varied in its configuration. A permanent mount, for example, may not include the hand gripping portion of the handle **54**.

The remote control **50** is further illustrated in the exploded view of FIG. **3**. The cable **52** of the remote control **50** has four conductors; **60**, **62**, **64** and **66**. The conductors **60**, **62**, **64** and **66** of the cable **52** must be adequate to conduct the high amperage current drawn by the motor **20**. In this embodiment, each conductor **60**, **62**, **64** and **66** is of the stranded wire type and is equivalent to #8 wire. The conductors **60**, **62**, **64** and **66**, in order to attain a high degree of flexibility are fabricated from smaller diameter wires than standard. In addition, the insulating sleeve surrounding each of the conductors **60**, **62**, **64** and **66** is thinner since it is not subject to high voltages. The conductors **60**, **62**, **64** and **66** are encased in a protective sleeve and a lubricant such as talcum is utilized between each of the conductors **60**, **62**, **64** and **66** to enhance the flexibility of the cable **52**.

One end **53** of the cable **52** has conductor **60** connected to a power source such as the battery **16** (via cable **18**) of the vehicle **12** and has conductor **62** connected to ground. Conductor **64** at end **53** is connected to a motor lead **112** and conductor **66** is connected to a motor lead **114** of the motor **20**. Switch gear is included or mounted within the handle assembly **54** of the remote control **50**. The switch gear in this embodiment is comprised essentially of two single pole, double throw switches that are normally biased to a connection with ground, which is best seen in the diagram of FIG. **4A**. As seen in FIG. **3**, conductor **60** is connected to a power plate **76** and the ground conductor **62** is connected to a ground plate **78**. Motor lead **66** is connected to a switch arm (pole) **72** and motor lead **64** is connected to a switch arm (pole) **74**. Switch arm **72** has a contact button **80** mounted strategic to a contact button **82** on the power plate **76**. The switch arm **72** also has a contact button **84** mounted strategic to a contact button **86** on the ground plate **78**. Similarly switch arm **74** has a contact button **88** mounted strategic to a contact button **90** of the power plate **76** and has a contact button **92** mounted strategic to a contact button **94** of the ground plate **78**. The switch arms (poles) **72**, **74** are of a spring material and are biased toward the ground plate **78**. Thus, in the static state button **84** of switch arm **72** is in contact with button **86** of the ground plate **78** and the contact button **92** of switch arm **74** is in contact with the contact button **94** of the ground plate **78**. A push button **56** is provided to move the switch arm **72** into contact with the power plate **76**, that is contact button **80** will be in contact with button **82** of the power plate **76**. Another push button **58** is provided to move the switch arm **74** toward the power plate **76** thus placing button **88** in contact with button **90**. Each of the push buttons **56**, **58** are biased outwardly as indicated by arrow **57** by springs **98**.

FIG. **4A**–**4C** illustrates in diagram form the operation of the remote control **50**. FIG. **4A** shows the remote control in the static state, this is, neither push button **56** or **58** have been depressed. As shown, each switch **72**, **74**, (switch arm **72**, **74**) is connected to ground (via ground plate **78** and conductor **62**).

FIG. **4B** shows the condition when push button **58** is depressed. As shown, the switch **74** (switch arm **74**) has been moved from a connection with the ground plate **78** to a connection with the power plate **76** (the power plate **76** is connected to a power source such as the battery **16** of the vehicle **12** by conductor **60**). Switch **74** will thus supply power via conductor **64** to a motor terminal **112** to provide motive power for the motor **20**. Motor terminal **114** is connected to ground via conductor **66**, the switch **72**, the ground plate **78** and conductor **62** to complete the circuit. The motor **20** will be driven in the rotative direction as indicated by the directional arrow **100**.

FIG. **4C** illustrates the condition where push button **56** has been depressed. As shown, the switch **72** (switch arm **72**) has been moved from a connection with the ground plate **78** to

a connection with the power plate **76** (the power plate **76** is connected to a power source such as the battery **16** of the vehicle **12** by conductor **60**). Switch **72** will thus supply power via conductor **66** to a motor terminal **114** to provide motive power for the motor **20**. Motor terminal **112** is connected to ground via conductor **64**, the switch **74**, the ground plate **78** and conductor **62** to complete the circuit. The motor **20** will be driven in the rotative direction as indicated by the directional arrow **102**.

It is advantageous to have the motor leads **112** and **114** electrically coupled together as shown in FIG. 4A when the control **50** is in the static or off position. Consider that the remote control **50** was utilized to operate the winch **10** by depressing the button **58** as illustrated in FIG. **4**B. When the button **58** is released to cut off power to the winch **10** (the condition illustrated in FIG. **4**A), the motor **20** instead of continuing to run due to a load on the wire rope **26** or simply coasting to a stop will be dynamically braked due to the interconnection of the motor leads **112** and **114** referred to as a short connection.

Those skilled in the art will recognize that modifications and variations may be made without departing from the true spirit and scope of the invention. The push buttons **56**, **58** may for example be replaced by a single operating lever (toggle) **120** as indicated in FIG. **5**. The lever **120** is pivotally mounted in the handle **54** and is normally biased to the center position. The center position is indicated by the numeral **122** and in this position the switches **72**, **74** are biased to a connection with the ground plate **78** (ground) in the same manner as shown in FIG. **4**A when neither push button **56** or **58** is depressed. The lever **120** when pivoted to position **124** moves the switch **72** into contact with the power plate **76** to supply power to the motor **20** via conductor **66** to cause rotation of the motor in the direction as indicated by the directional arrow **128**. The lever **120** when pivoted to position **126** will move the switch **74** into contact with the power plate **76** to supply power to the motor **20** via conductor **64** to cause rotation of the motor **20** in the direction indicated by the dashed directional arrow **130**. The above is but one example of a modification and/or variation contemplated in the remote controlled winch of the present invention.

The invention is therefore not to be limited to the embodiments described and illustrated but is to be determined from the appended claims.

What is claimed is:

1. A winch comprising:

a base structure;

a drum rotatably mounted on the base structure;

an electrically powered motor including a drive shaft coupled to the drum, said motor arranged to rotate the shaft and drum coupled thereto in opposite rotative directions in response to reversal of polarity of electrical power input to the motor from a pair of power source conductors;

an electrical power source and a first pair of conductors from said power source including a power conductor and a ground conductor;

a remote control and a second pair of conductors from the remote control to the motor for supplying said electrical power input to the motor, said first pair of conductors extended to said remote control and terminating in exposed terminal ends in spaced apart relation, said second pair of conductors having exposed terminal ends in spaced apart relation positioned between said exposed terminal ends of said first pair of conductors, said terminal ends of said second pair of conductors biased toward the exposed terminal end of said ground conductor of said first pair of conductors; and

a mechanism engageable with the terminal ends of said second pair of conductors for selectively manually moving said terminal ends of said second pair of conductors away from the exposed terminal end of said ground conductor toward the exposed terminal end of said power conductor for selective and reversal power input to said winch motor.

2. A winch as defined in claim **1** wherein:

said mechanism includes first and second manual push buttons.

3. A winch as defined in claim **2** wherein:

said mechanism includes a toggle.

4. A winch as defined in claim **1** wherein:

said remote control includes a housing containing said terminal ends and said mechanism for moving said terminal ends, said housing formed into a hand piece.

* * * * *